Table I **[**listed**]** **lists** the birefringence of potential birefringent materials for fabricating the proposed delay lines. Note that different crystals may be used together to construct a delay line: a crystal with small birefringence can be used to make segments of small delays (less significant bits) and a crystal with large birefringence can be used to make segments of large delays (more significant bits).

In the Claims:

Kindly cancel Claims 1-30 of the original patent No. 5,978,125 as follows:

Please add the following new Claims 31-80:

31. A variable optical delay device, comprising a plurality of variable optical delay units cascaded to form an optical path through which an optical beam is directed, each variable optical delay unit producing a variable optical delay and comprising:

a polarization rotator operable to control a polarization of received light in response to a unit control signal;

a birefringent segment formed of a birefringent material and located in said optical path to receive output

light from said polarization rotator and to transmit received light along said optical path; and

a unit control element, coupled to said polarization rotator to supply said unit control signal, to control light received by said birefringent segment in a first polarization state to cause a first optical delay in light output by said birefringent segment and in a second polarization state to cause a second, different optical delay in light output by said birefringent segment.

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32. The device as in claim 31, wherein said birefringent material includes a birefringent crystal.

33. The device as in claim 31, wherein said birefringent material includes a PM fiber.

34. The device as in claim 31, wherein different birefringent segments in different variable optical delay units have different lengths along said optical path.

35. The device as in claim 34, wherein two adjacent different birefringent segments differ in length by a constant factor.

36. The device as in claim 35, wherein said constant factor is 2.

37. The device as in claim 34, wherein lengths of said different birefringent segments increase successively along said optical path from a first variable optical delay unit that receives an optical beam to a last variable optical delay unit that outputs said optical beam.

38. The device as in claim 34, wherein said variable optical delay units includes a first variable optical delay unit whose birefringent segment is formed of a first birefringent material and a second variable optical delay unit whose birefringent segment is formed of a second birefringent material that has birefringence different from said first birefringent material.

39. The device as in claim 34, wherein at least one birefringent segment in one variable optical delay unit is formed of a birefringent material that is responsive to an index-control signal to change a refractive index and thus an

associated optical delay therein to fine tune a total variable optical delay.

40. The device as in claim 31, wherein said variable optical delay units includes a first variable optical delay unit whose birefringent segment is formed of a first birefringent material and a second variable optical delay unit whose birefringent segment is formed of a second birefringent material that has birefringence different from said first birefringent material.

41. The device as in claim 31, wherein at least one birefringent segment in one variable optical delay unit is formed of a birefringent material that is responsive to an index-control signal to change a refractive index and thus an associated optical delay therein to fine tune a total variable optical delay.

42. The device as in claim 41, wherein said birefringent material exhibits an electro-optic effect and said index-control signal is an electric field, and wherein said one variable optical delay unit further includes a pair of electrodes coupled to said birefringent segment to supply said electric field.

43. The device as in claim 41, wherein different birefringent segments in different variable optical delay units have different lengths along said optical path.

44. The device as in claim 41, wherein birefringent segments in at least two variable optical delay units are formed of different birefringent materials.

45. The device as in claim 31, further comprising a ladder-structured optical module optically coupled in said optical path to receive an output beam from said plurality of variable optical delay units, wherein said ladder-structured optical module includes:

a plurality of ladder units stacked over one another to form a first optical path along which said output beam is received and a second optical path along which said output beam is exported to produce an additional variable optical delay; and

a common corner reflector coupled to said plurality of ladder units to reflect transmitted light from said first optical path to said second optical path,

wherein each ladder unit comprises:

a first polarization beamsplitter located in said first optical path to transmit light in a transmitting polarization and to reflect light in a reflecting polarization orthogonal to said transmitting polarization;

a second polarization beamsplitter located in said second optical path and coupled to said first polarization beamsplitter to receive light reflected from said first polarization beamsplitter and to direct received light to said second optical path, said first and said second polarization beamsplitters forming a polarization-sensitive corner reflector which transmits light of said transmitting polarization along said first optical path towards said common corner reflector and directs light of said reflecting polarization along said second optical path away from said common corner reflector;

a first polarization rotator in said first optical path and adjacent to said first polarization beamsplitter to control a polarization of light entering said first polarization beam splitter to vary an optical delay of said light when exiting said ladder-structured optical module;

a second polarization rotator in said second optical path and adjacent to said second polarization beamsplitter to control a polarization of light exiting said second polarization

beam splitter in a manner identical to said first polarization rotator; and

a control unit coupled to control said first and said second polarization rotators.

46. The device as in claim 45, wherein at least a portion of successive ladder units are spaced from one another by different distances.

47. The device as in claim 45, wherein a distance between two adjacent ladder units in said portion increase successively by a factor of 2.

48. The device as in claim 31, wherein said polarization rotator in each variable optical delay unit is selected from a group consisting of a liquid crystal polarization rotator, a half-wave plate polarization rotator, a magneto-optic polarization rotator, and an electro-optic polarization rotator.

49. A variable optical delay device, comprising a plurality of variable optical delay units arranged relative to one another to form an optical path through which an optical beam is directed, each variable optical delay unit comprising:

Sub D1

a polarization rotator operable to control a polarization of received light in response to a unit control signal;

a PM fiber segment located in said optical path to receive output light from said polarization rotator and to transmit received light along said optical path; and

a unit control element, coupled to said polarization rotator to supply said unit control signal, to control light received by said PM fiber segment in a first polarization state to cause a first optical delay in light output by said PM fiber segment and in a second polarization state to cause a second, different optical delay in light output by said PM fiber segment.

50. The device as in claim 49, wherein each PM fiber segment in one variable optical delay unit has a length along said optical path different from lengths of other PM fiber segments in other variable optical delay units.

51. The device as in claim 50, wherein said polarization rotator in each variable optical delay unit is selected from a group consisting of a liquid crystal polarization rotator, a

half-wave plate polarization rotator, a magneto-optic polarization rotator, and an electro-optic polarization rotator.

52. The device as in claim 50, wherein lengths of PM fiber segments along said optical path of two adjacent variable optical delay units are different by a constant factor of 2.

53. The device as in claim 50, wherein at least two PM fiber segments in two different variable optical delay units exhibit different amounts of birefringence.

54. The device as in claim 50, wherein at least one PM fiber segment in one variable optical delay unit is configured to change a refractive index in response to a control signal, and wherein said one variable optical delay unit further includes an index control element coupled to supply said control signal to vary said refractive index and thus adjust an optical delay in light output by said one variable optical delay unit in addition to a control of said optical delay by said polarization rotator.

55. The device as in claim 54, wherein said one PM fiber segment exhibits an electro-optic effect and said index-control

signal is an electric field, and wherein said one variable optical delay unit further includes a pair of electrodes.

56. A method for producing a variable optical delay in an optical beam, comprising:

causing the optical beam to transmit through a plurality of birefringent segments along an optical path;

causing polarization states of the optical beam upon respective entry of the plurality of birefringent segments to be controlled at a first set of polarization states, respectively, to produce a first optical delay in the optical beam upon exiting the plurality of birefringent segments; and

causing a polarization state of the optical beam upon entry of at least one of the plurality of birefringent segments to be changed to produce a second, different optical delay in the optical beam upon exiting the plurality of birefringent segments.

57. The method as in claim 56, further comprising causing the plurality of birefringent segments to have different lengths along the optical path.

58. The method as in claim 57, wherein lengths of two different birefringent segments are different by a factor of 2^n, where n is a positive integer factor.

59. The method as in claim 56, further comprising causing at least two of the plurality of birefringent segments to be formed of different birefringent materials with different amounts of birefringence.

60. The method as in claim 56, further comprising:

causing at least one birefringent segment to include a birefringent material that changes a refractive index in response to an index control signal; and

causing the index control signal to be applied to the birefringent material to modify the second optical delay.

61. The method as in claim 60, further comprising causing each of the birefringent segments to include a PM fiber segment.

62. The method as in claim 56, further comprising causing the birefringent segments to include PM fiber segments.

63. The method as in Claim 62, further comprising causing two different PM fiber segments to have different amounts of birefringence.

64. A device having a variable optical delay mechanism, comprising:

a plurality of variable optical delay units cascaded to form a plurality of parallel optical paths, each variable optical delay unit comprising (1) a polarization rotator array of a plurality of polarization rotators respectively located in said parallel optical paths, and (2) a birefringent segment formed of a birefringent material and located in said parallel optical paths to receive and transmit output light from said polarization rotator array, wherein each polarization rotator is operable to control a polarization of received light in a first polarization state to cause a first optical delay in light output by said birefringent segment and in a second polarization state to cause a second, different optical delay in light output by said birefringent segment; and

a detector array of a plurality of optical detectors respectively located in said parallel optical paths to receive output beams output from said plurality of variable optical delay units to produce a plurality of detector signals

corresponding to said output beams of said parallel optical paths.

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65. The device as in claim 64, wherein different birefringent segments have different lengths along said parallel optical paths.

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66. The device as in claim 65, wherein lengths of two different birefringent segments are different by a factor of 2^n, where n is a positive integer.

67. The device as in claim 64, wherein at least two of said plurality of birefringent segments are formed of different birefringent materials with different amounts of birefringence.

Sub D1

68. The device as in claim 64, further comprising a laser array of lasers responding to a plurality of electrical signals to produce a plurality of laser beams respectively directed into said parallel optical paths, wherein said detector signals respectively represent said electrical signals with different delays optically produced by said plurality of variable optical delay units.

69. The device as in claim 64, further comprising:

a laser driven by an electrical signal to produce a laser beam that carries information in said electrical signal; and

a lens located between said laser and said plurality of variable optical delay units to expand said laser beam and to direct said expanded laser beam to cover said parallel optical paths formed by said plurality of variable optical delay units, wherein different parts of said expanded laser beam undergo different optical delays through said plurality of variable optical delay units and said detector signals are replica of said electrical signal with different delays.

70. The device as in claim 69, further comprising a grid amplifier that amplifies said detector signals.

71. The device as in claim 69, further comprising an electrical signal combiner coupled to said detector array to combine said detector signals to produce a single detector output that represents a filtered result of said electrical signal.

72. A method, comprising:

causing generation of an optical beam to carry information of an input electrical signal;

causing the optical beam to be expanded to allow for different parts of the optical beam to transmit through different optical paths that go through a plurality of birefringent segments;

causing polarization states of the different parts of the expanded optical beam upon entry of the plurality of birefringent segments to be controlled to produce different optical delays on the different parts of the expanded optical beam upon exiting the plurality of birefringent segments; and

causing different parts of the expanded optical beam to be converted into a plurality of electrical output signals.

73. The method as in claim 72, further comprising causing the electrical output signals to be combined into a single electrical output signal that represents a filtered result of the input electrical signal.

74. The method as in claim 72, further comprising causing the plurality of birefringent segments to have different lengths along the parallel optical paths.

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75. The method as in claim 72, wherein lengths of two different birefringent segments are different by a factor of 2^n, where n is a positive integer.

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76. The method as in claim 72, further comprising causing at least two of the plurality of birefringent segments to be formed of different birefringent materials with different amounts of birefringence.

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77. A method, comprising:

causing generation of a plurality of optical beams to carry information of a plurality of input electrical signals;

causing the optical beams to transmit through different optical paths that go through a plurality of birefringent segments;

causing polarization states of the optical beams upon entry of the plurality of birefringent segments to be controlled to produce different optical delays on the different optical beams upon exiting the plurality of birefringent segments; and

subsequently causing different optical beams to be converted into a plurality of electrical output signals that represent the input electrical signals with different delays.

78. The method as in claim 77, further comprising causing the plurality of birefringent segments to have different lengths along the parallel optical paths.

79. The method as in claim 78, wherein lengths of two different birefringent segments are different by a factor of 2^n, where n is a positive integer.

80. The method as in claim 77, further comprising causing at least two of the plurality of birefringent segments to be formed of different birefringent materials with different amounts of birefringence.

In the Drawings:

Please delete Fig. 11 in the original patent No. 5,978,125.

REMARKS

Consideration and allowance of the above-referenced reissue application are respectfully requested.

A new paragraph is added at beginning of Column 1 to identify the existence of another copending broadening reissue application of the same patent 5,978,125 as required by 37 CFR 1.177(a). In addition, the paragraph beginning on Column 9, line 37 of the specification in the original patent No.

5,978,125 is amended to correct a typographical error by replacing "listed" with "lists." No new matter is added.

Fig. 11 of the original patent No. 5,978,125 has been deleted. Apparently, Fig. 11 was included by error because it is a duplicate of Fig. 6C and the original specification does not have any reference with respect to or description on Fig. 11. Hence, deletion of Fig. 11 does not add new matter to the reissue application.

Claims 1-30 of the original patent No. 5,978,125 have been cancelled. Claims 31-80 are newly added. Upon entry of the above amendment, Claims 31-80 are pending in this reissue application.

New Claims 31-80 are fully supported by the originally-filed specification. The following lists exemplary support for each and every newly added claim:

Claim 31: Figs. 5B, 5C, 6A, 6B, 6C, 7A, 7B, and 8, and corresponding textual description including, Column 9, lines 25-44.

Claim 32: Column 9, lines 25-44.

Claim 33: Column 9, line 35 in Table I.

Claim 34: Column 7, lines 24-41 and FIG. 5C.

Claim 35: Column 7, lines 24-41 and FIG. 5C.

Claim 36: Column 7, lines 24-41 and FIG. 5C.

Claim 37: Column 7, lines 24-41 and FIG. 5C.

Claim 38: Column 9, lines 39-44.

Claim 39: Column 7, lines 19-23 and FIG. 5B.

Claim 40: Column 9, lines 39-44.

Claim 41: Column 7, lines 19-23 and FIG. 5B.

Claim 42: Column 7, lines 19-23 and FIG. 5B.

Claim 43: Column 7, lines 24-41 and FIG. 5C.

Claim 44: Column 9, lines 39-44.

Claim 45: Fig. 8; and Column 10, lines 27-44.

Claim 46: Column 5, line 56 to Column 6, line 10.

Claim 47: Column 5, line 56 to Column 6, line 10.

Claim 48: Column 7, lines 12-15.

Claim 49: Figs. 5B and 2C and their corresponding textual description and Column 9, lines 25-44.

Claim 50: Column 7, lines 24-41 and FIG. 5C.

Claim 51: Column 7, liens 12-15.

Claim 52: Column 7, lines 24-41 and FIG. 5C.

Claim 53: Column 9, lines 39-44.

Claim 54: Column 7, lines 19-23 and FIG. 5B.

Claim 55: Column 7, lines 19-23 and FIG. 5B.

Claim 56: Figs. 5B, 5C, 6A, 6B, 6C, 7A, 7B, and 8, and corresponding textual description including, Column 9, lines 25-44.

Claim 57: Column 7, lines 24-41 and FIG. 5C.

Claim 58: Column 7, lines 24-41 and FIG. 5C.

Claim 59: Column 9, lines 39-44.

Claim 60: Column 7, lines 19-23 and FIG. 5B.

Claim 61: Column 9, line 35 in Table I.

Claim 62: Column 9, line 35 in Table I.

Claim 63: Column 9, line 35 in Table I; and lines 39-44.

Claim 64: Figs. 6A, 6B, and 6C and their corresponding textual description; and Column 9, lines 25-44.

Claim 65: Column 7, lines 24-41.

Claim 66: Column 7, lines 24-41.

Claim 67: Column 9, lines 39-44.

Claim 68: Figs. 6B and 6C and their corresponding textual description.

Claim 69: Figs. 6B and 6C and their corresponding textual description.

Claim 70: Fig. 6B and its corresponding textual description.

Claim 71: Fig. 6C and its corresponding textual description.

Claim 72: Figs. 6A, 6B, and 6C and their corresponding textual description;

Claim 73: Fig. 6C and its corresponding textual description.

Claim 74: Column 7, lines 24-41 and Figs. 6A, 6B, and 6C.

Claim 75: Column 7, lines 24-41 and Figs. 5C, 6B and 6C.

Claim 76: Column 9, lines 39-44.

Claim 77: Figs. 6A, 7A, and 7B and their respective textual description.

Claim 78: Column 7, lines 24-41 and Fig. 5C, 6A, 7A and 7B.

Claim 79: Column 7, lines 24-41 and Fig. 5C, 6A, 7A and 7B.

Claim 80: Column 9, lines 39-44.

In view of the above, this preliminary amendment to the specification, the drawings, and the claims is fully supported by and is completely consistent with the originally-filed specification of the patent No. 5,978,125. Hence, no new matter is added.

Applicant respectively submits that new Claims 31-80 are fully described in the original patent specification and are enabled by the original patent specification under 35 USC 112. In addition, nothing in the original patent specification indicates an intent not to claim the subject matter of the claims presented in the reissue application. Furthermore, the file history of the original patent No. 5,978,125 does not contain any statement that would either suggest an intent not to

claim the subject matter of the claims presented in the reissue application, or prevent Applicant from asserting his rights in the subject matter of the claims presented in the reissue application.

Therefore, Applicant respectively submits that Claims 30-80 as presented by this amendment are for the same general invention in the original patent No. 5,978,125 and are distinctly patentable over the prior art on record. Accordingly, all Claims 30-80 are now in full condition for allowance and an early issuance of an official notice of allowance is earnestly requested.

Enclosed is a $180 check for excess claim fees. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: November 2, 2001

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